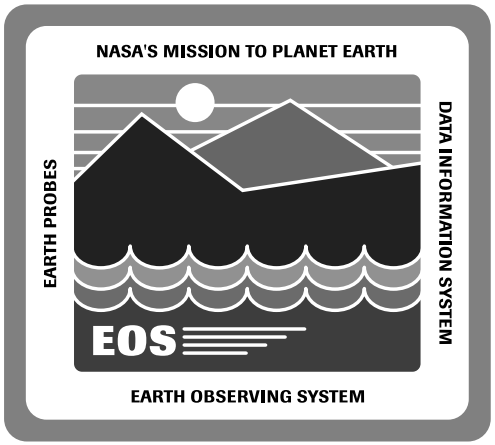


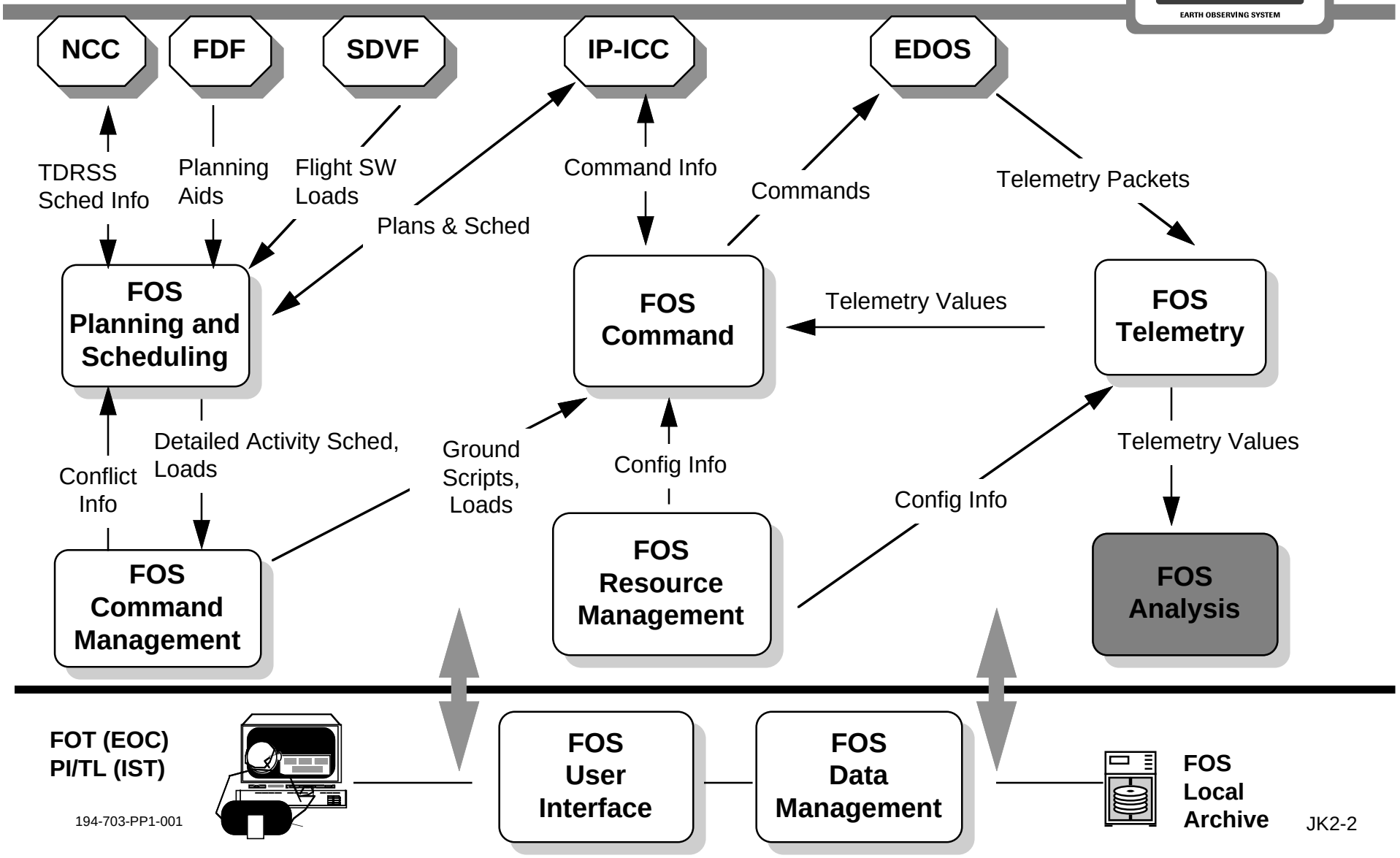
Analysis Subsystem

Jon Kuntz

System Design Review - 28 June 1994

SDS - 5.4.5

FOS Subsystem Diagram



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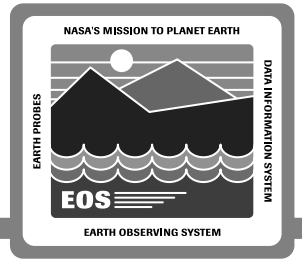
Analysis Subsystem Outline



Analysis Overview

- **Analysis Functions**
- **Analysis Design Drivers**

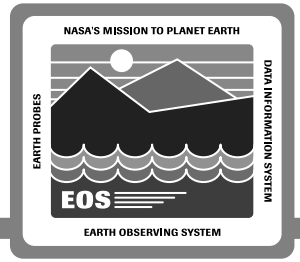
Analysis Subsystem Context

- **Context Diagram**
- **Context Diagram Description**

Analysis Subsystem Design

- **Analysis Object Model**
- **Analysis Object Model Description**
- **Analysis Scenario - Routine Plotting**
- **Analysis Scenario - Performance Degradation**

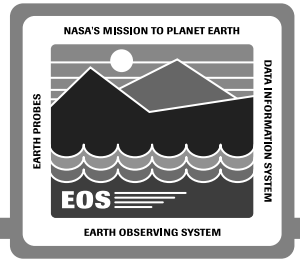
Analysis Subsystem Overview



The function of the Analysis subsystem is to provide the resources for the analysis of the U.S. spacecraft and its subsystems and instrument payload. This includes:

- **Trend analysis**
- **Performance analysis**
- **Configuration monitoring**
- **Management of spacecraft resources**
- **Fault management**

Analysis Subsystem Design Drivers



Requirements

Operator Flexibility/Usability

- The user will be able to add new analysis functions
- Routine analysis tasks can be set to run automatically

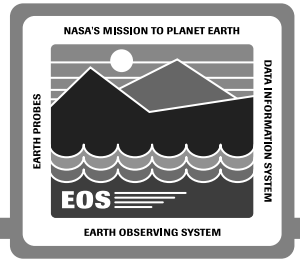
Scalability

- The design will scale up/down for each spacecraft
- The design will support the addition of new requirements

Technology Insertion

- The design will provide hooks for inserting new analysis algorithms and/or COTS products

Analysis Subsystem Design Drivers



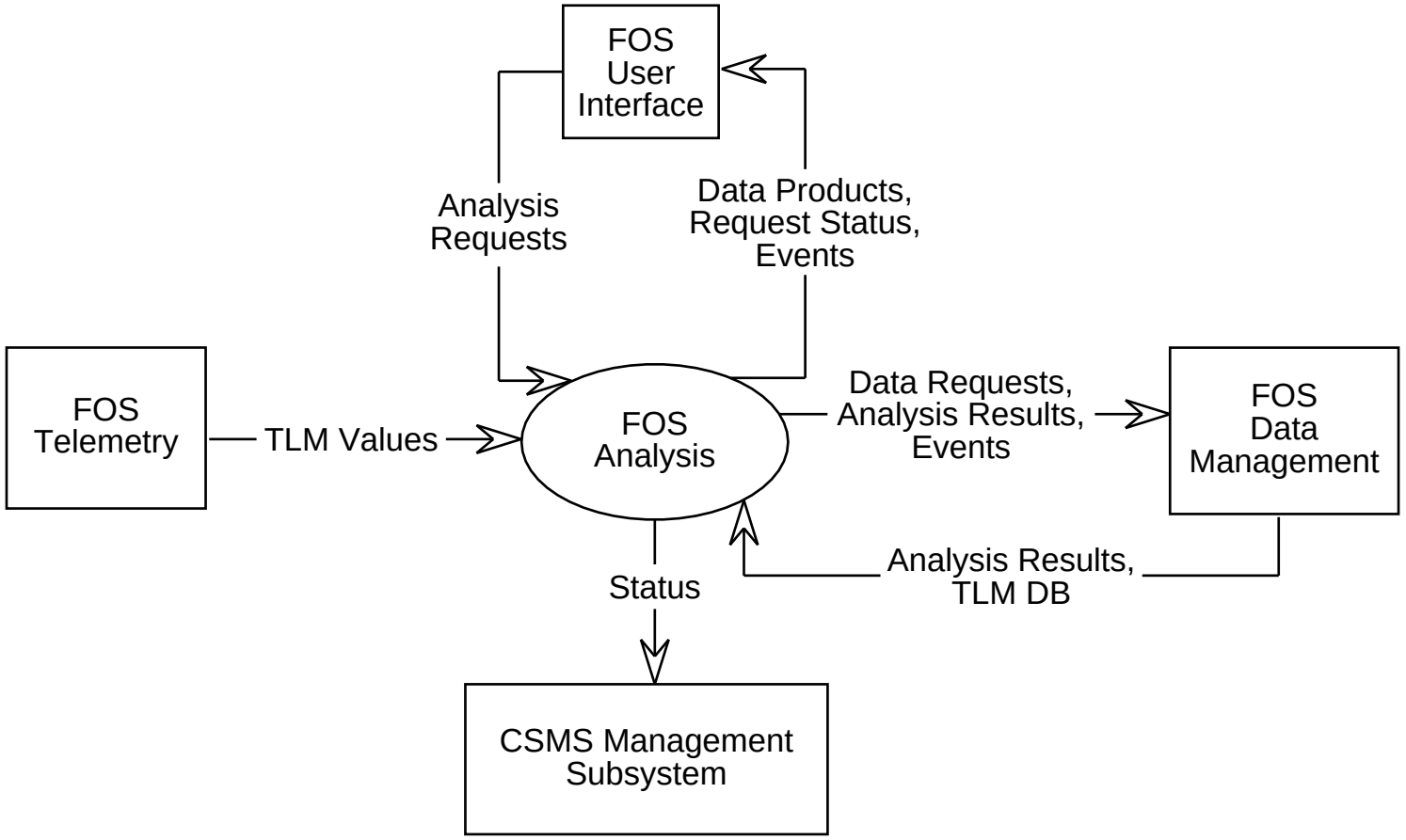
Tours and Demos of existing systems and products

- **PORTS/ESS, TPOCC/GTAS, TALOS, EP**
- **G2, RT*Works, GenSAA**

Technical Exchange

- **Operations Team**
- **AM1 Spacecraft provider**

Analysis Subsystem Context Diagram

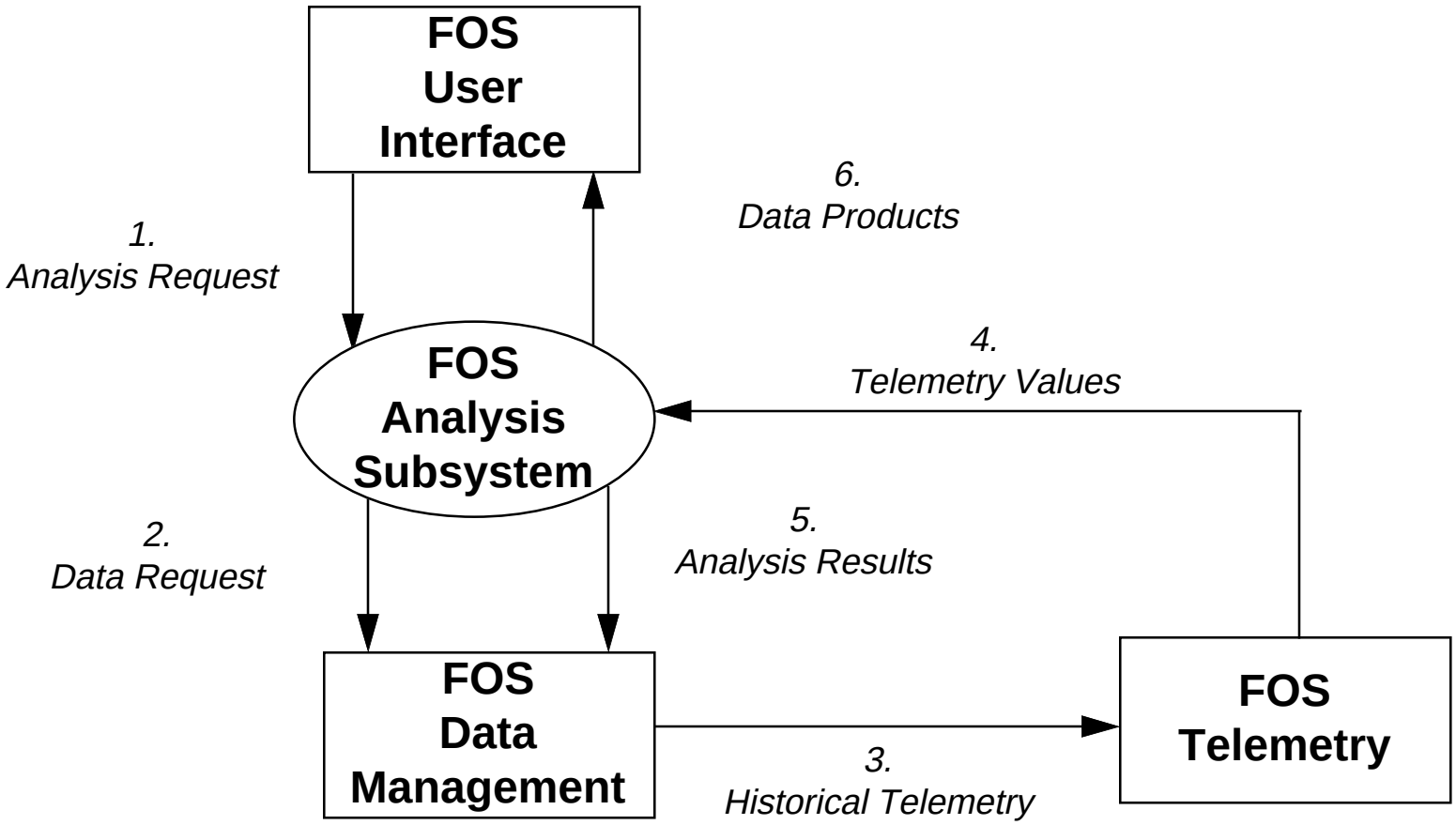


Analysis Subsystem Context Diagram Description

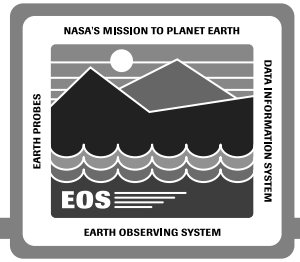
Key Interfaces supporting data analysis

- **User Interface subsystem**
  - **Receipt of analysis requests**
  - **Providing data products**
- **Data Management subsystem**
  - **Requesting archived data**
  - **Receipt of special processing algorithms**
- **Telemetry subsystem**
  - **Receiving decommutated telemetry values**

Analysis Subsystem
Plot Request Scenario Diagram

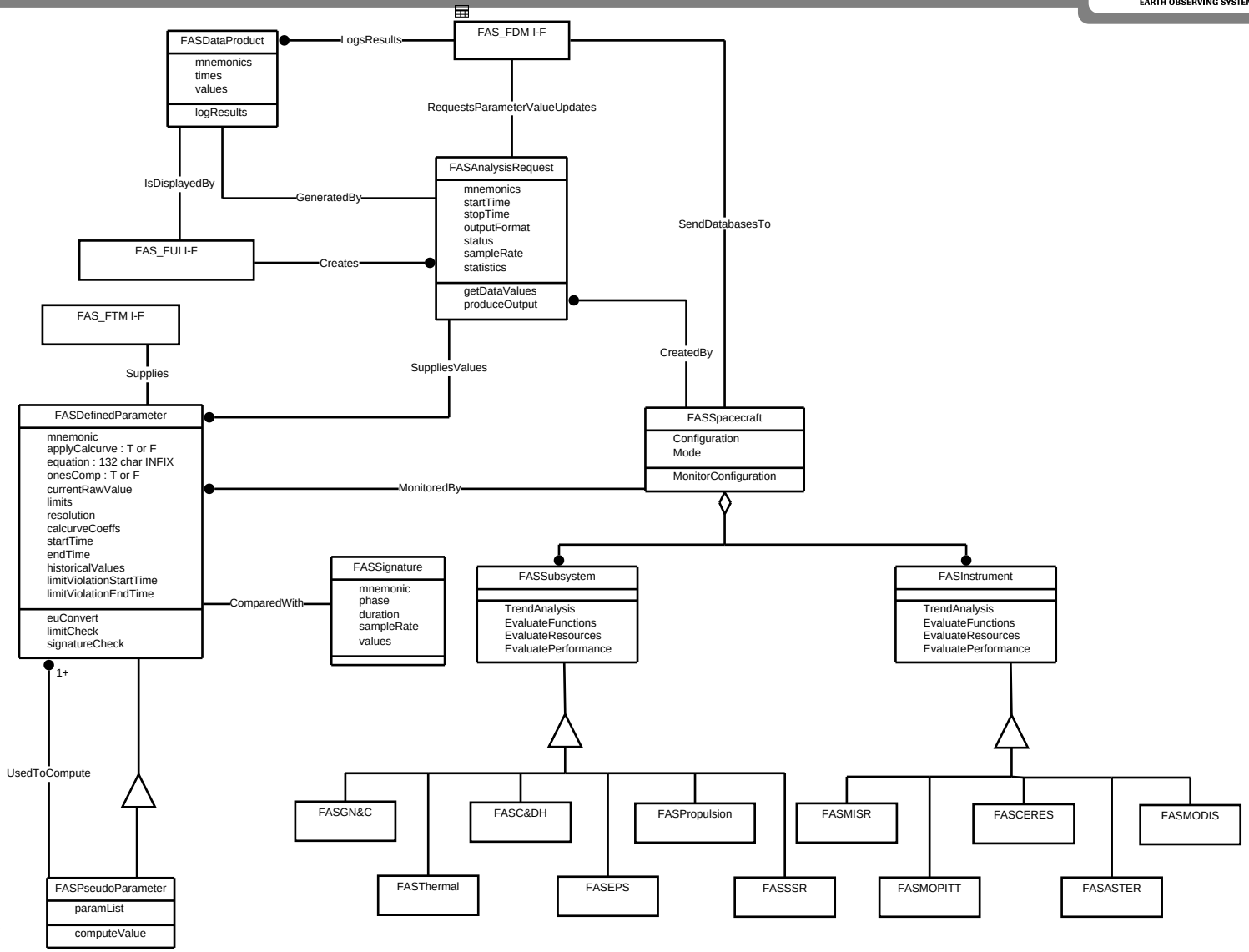


Analysis Subsystem Plot Request Scenario

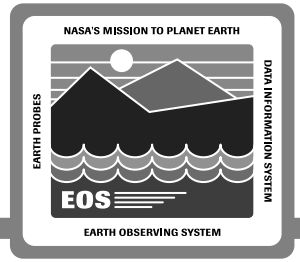


- Request is received from the User Interface requesting a parameter vs time plot (1)
- Analysis requests the appropriate data from Data Management (2)
- Data Management provides the selected historical data to the Telemetry subsystem (3)
- Analysis receives the telemetry values from Telemetry subsystem (4)
- Results of the analysis are sent to Data Management for storage (5)
- Analysis produces the requested data product and supplies it to the User Interface for display (6)

Analysis Subsystem Object Model



Analysis Subsystem Object Model Description



FASAnalysisRequest Class

- **Determines the specifics of each analysis request based upon information received from User Interface subsystem**
- **Generates data products formatted for display by the User Interface**

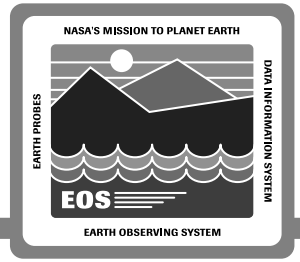
FASDefinedParameter Class

- **Receives telemetry values from Telemetry subsystem**
- **Provides processing of telemetry values**
  - **Conversions**
  - **Limit checks**
  - **Signature checks**

FASSpacecraft Class Hierarchy

- **Superclass which contains the spacecraft subsystems and instruments**
- **Provides support for multiple spacecraft through multiple instances**

Analysis Subsystem Object Model Description



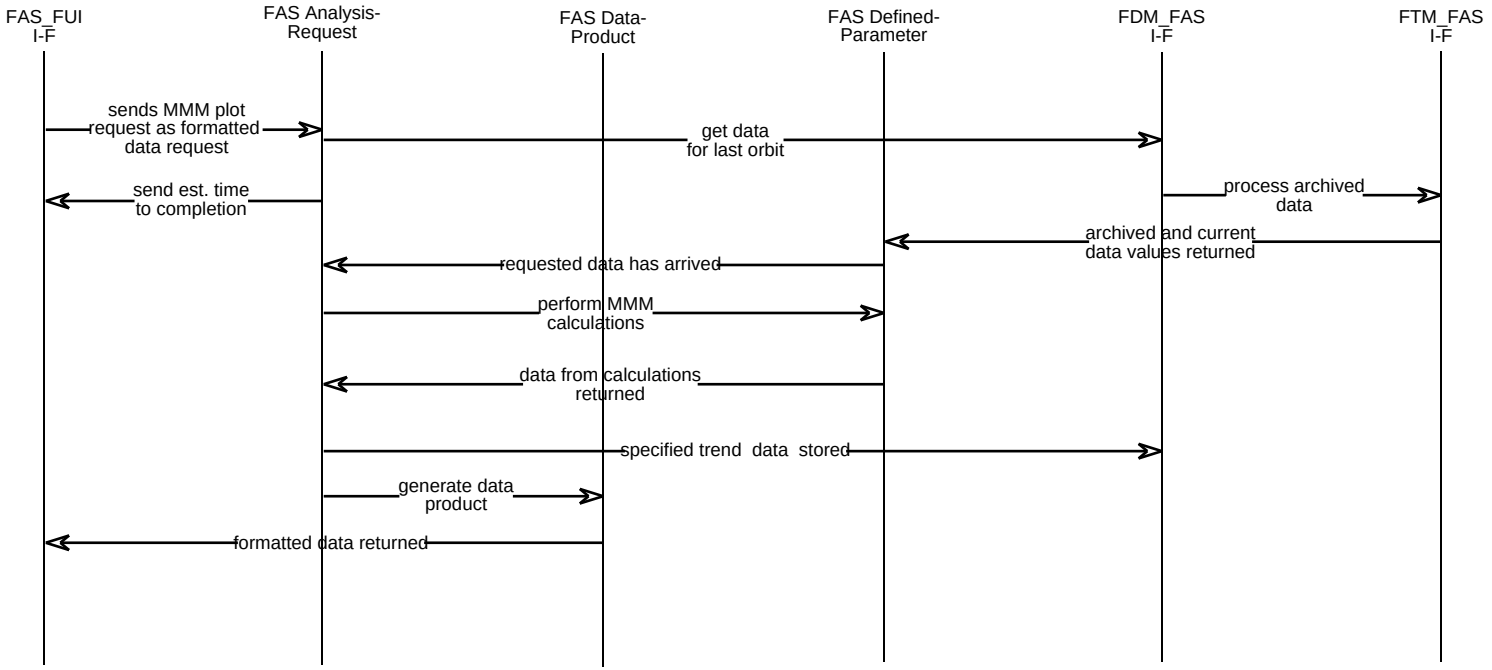
FASSubsystem Class and FASInstrument Class

- **Contain algorithms to analyze their own behavior**
- **Allows new algorithms to be added as needed**
- **Additional subsystems and/or instruments can be added by defining new classes in the hierarchy without affecting the existing ones**
- **Provides support for multiple subsystems and instruments by creating multiple instances**

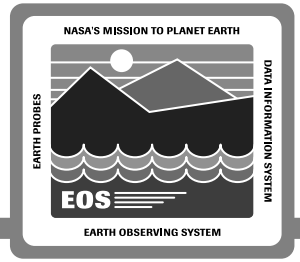
FASDataProduct Class

- **Defines format of output product from Analysis subsystem**
  - **Plotting package**
  - **Reports**
  - **Carry out**
- **Provides framework for integration of COTS analysis tools into the system**

Analysis Scenario: Routine Plotting

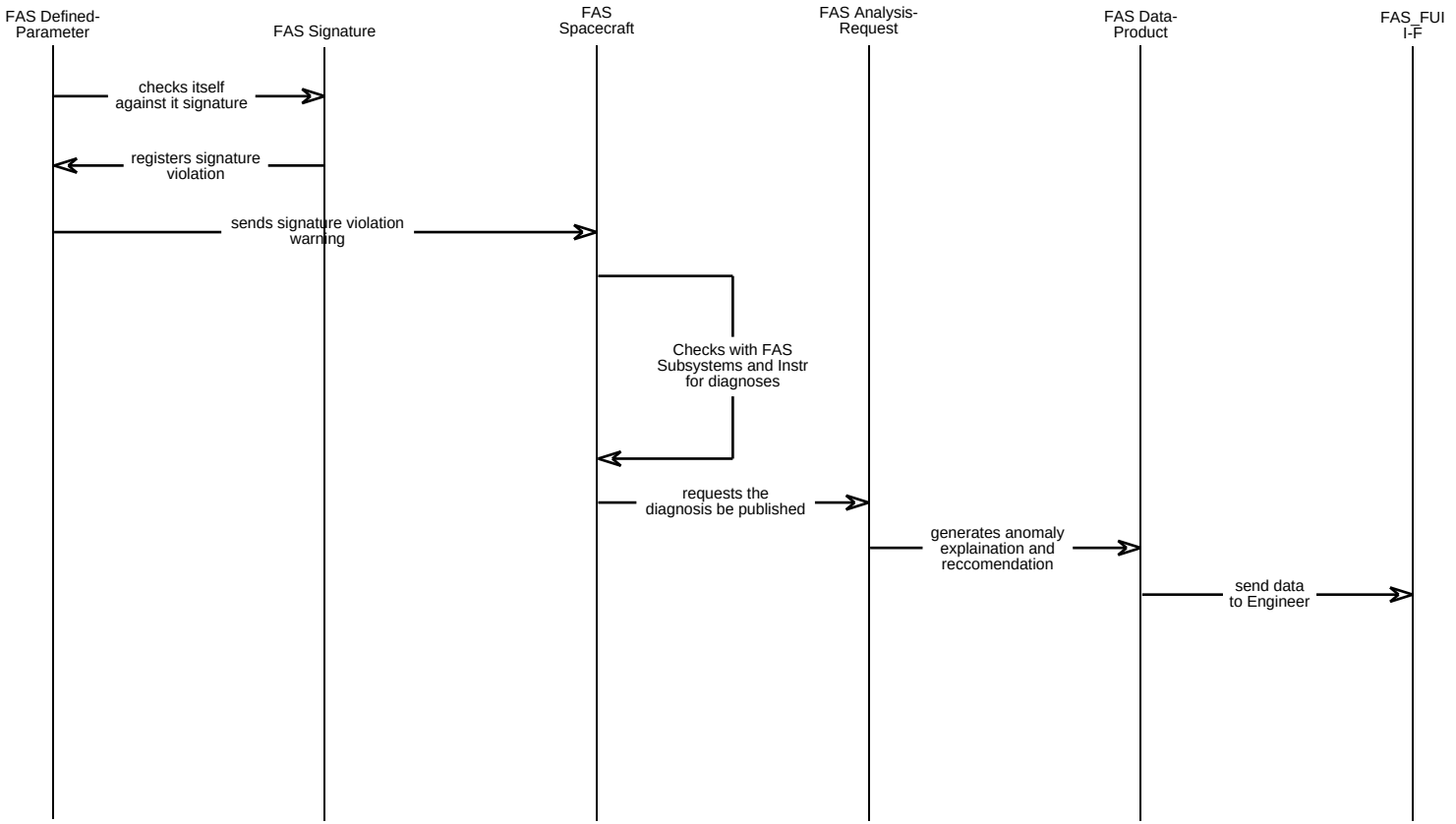


Analysis Scenario: Routine Plotting

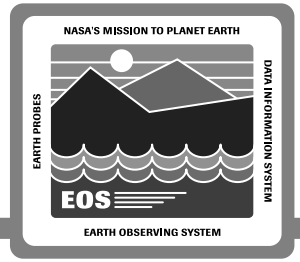


- User Interface submits request for MMM plot based upon standing orders after each orbit
- Analysis requests the data from Data Management
- Analysis returns estimated time to completion information to the User Interface
- Data Management provides the requested data to Telemetry for decommutation
- Telemetry provides the telemetry values to Analysis
- Analysis performs the MMM calculations on the data and formats the data for the User Interface
- User Interface receives the formatted data and displays the plots

Analysis Scenario: Performance Degradation



Analysis Scenario: Performance Degradation



- As part of the automated routine analysis process, parameter values are checked against their expected signatures
- The routine analysis detects that a signature check has failed
- The subsystem /instrument class executes a pre-defined special processing algorithm to isolate the problem
- The algorithm determines the cause of the problem
- A report is generated which details the fault and provides a recommendation for recovery
- User Interface receives the report and displays the data for the FOT